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Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

(First Reprint DECEMBER 1997)

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Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

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Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

0. FOREWORD

0.1 This Indian Standard (Part 17) was adopted by the Indian Standards Institution on 20 February 1985, after the draft finalized by the Environmental Testing Procedures Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This standard (Part 17) covers the following guidance details:

a) Guidance for shock test (Section 1),
b) Guidance for bump test (Section 2),
c) Guidance for drop and topple test (Section 3), and
d) Guidance for free fall test (Section 4).

0.2.1 The test procedure for impact test is covered in IS : 9000 (Part 7)-1979*.

0.3 In the preparation of this standard, assistance has been derived from the following:

Amendment No. 1 Guidance to IEC Pub 68-2-27 (1972) Basic Environmental Testing Procedures, Part 2 Tests, Test Ea Shock. International Electrotechnical Commission (IEC).

Amendment No. 1 Guidance to IEC Pub 68-2-29 (1968) Basic Environmental Testing Procedures, Part 2 Tests, Test Eb : Bump. International Electrotechnical Commission (IEC).

Amendment No. 1 Guidance to IEC Pub. 68-2-31 (1969) Basic Environmental Testing Procedures, Part 2 Tests, Test Ec Drop and Topple, Primarily for Equipment Type Specimens. International Electrotechnical Commission (IEC).

Amendment No. 1 Guidance to IEC Pub 68-2-32 (1975) Basic Environmental Testing Procedures, Part 2 Tests, Test Ed : Free Fall (Procedure 1). International Electrotechnical Commission (IEC).

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

Section 1 Shock Test

1. SCOPE

1.1 This standard (Part 17/Sec 1) deals with guidance for the shock test for electronic and electrical items.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions and explanation of terms given in IS : 9000 (Part 1)-1977* shall apply.

3. OBJECT

3.1 Many equipments are liable to be subjected to shock during use, handling and transportation. These shocks will be at widely varying levels and will also be of a complex nature.

3.2 The shock test provides a convenient method for establishing the ability of the item to withstand these conditions of non-repetitive shocks; for repetitive shocks, the bump test is considered as more appropriate (*see* **4**).

3.3 Three shapes of shock pulse which are in general use are given in this specification and for test purposes any of these may be used.

3.4 The half-sine Σ pulse is applied where simulating the effects of a shock resulting from impact with or retardation by a linear rate system (for example, impact involving resilient structure, packaging shock).

3.5 The trapezoidal pulse produces a higher response over a wider frequency spectrum than the half-sine pulse; it should be applied when the test is to reproduce the effects of a real trapezoidal shock environment, for example, from an explosive blast, a space vehicle launch.

3.6 The final-peak saw-tooth pulse has a more uniform frequency spectrum than the half-sine and trapeziodal pulse shapes.

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*Basic environmental testing procedures for electronic and electrical items: Part 1 General.

3.7 Information on the shock response spectra associated with these pulses is given in Appendix A of Section 1 of IS : 9000 (Part 7)-1979*.

3.8 In some cases, it is required to simulate a shock whose characteristics are not covered by the standard pulse shapes shown in Fig. 1, 2 and 3 of IS : 9000 (Part 7)-1979*, for example, shock induced by underwater explosion, parachute snatch, etc. In such cases the relevant specification will need to state the corresponding test requirements.

3.9 The shock test is also suitable for internal robustness tests which may be required to be carried out on items which by design incorporate an assembly within a gas, liquid or jelly filled enclosure, or within an evacuated enclosure, but are not normally required for solidly filled or thermosetting resin encapsulated items, that do not have internal cavities.

4. RELATED TESTS

4.1 The related tests are given below:

Bump test [Section 2 of IS : 9000 (Part 7)-1979*]	— simulates the effects of repetitive shocks likely to be experienced by equipments and components during transportation or when installed in various classes of vehicle.
Drop and topple test [Section 3 of IS : 9000 (Part 7)-1979*]	— is a simple test intended to assess the effects of knocks or jolts likely to be received primarily by equipment type items during repair work or rough handling on a table or bench.
Free fall test [Section 4 of IS : 9000 (Part 7)-1979*]	— is a sample test intended to assess the effects of falls likely to be experienced due to rough handling. It is also suitable to demonstrate a degree of robustness.
Repeated free fall test [Section 5 of IS : 9000 (Part 7)-1979*]	— also simulates repetitive shocks likely to be received by certain component type items, for example, connectors in service.
Bounce test (under consideration)	— is intended to simulate the random shock conditions experienced by items which may be carried as loose cargo on wheeled vehicles travelling over irregular surfaces.

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

4.2 Shock and bump tests are performed on the test item when fixed to the test machine. Drop and topple, free fall, repeated free fall and bounce tests are performed with the test item free.

5. SELECTION OF PULSE SHAPES AND TEST SEVERITIES

5.1 The specification writer intending to prescribe this test should refer to **11** of IS : 9000 (Part 7)-1979* to ensure that all such information is included in the relevant specification.

5.2 Wherever possible, the test severity and the shape of the shock pulse applied to the item should be related to the real environment to which the item will be subjected, during either transportation or operation, or to the design requirements if the object of the test is to assess structural integrity.

5.3 It should be noted that frequently the transport environment is more severe than the operational environment and in these circumstances the test severity chosen may need to be related to the transport environment.

5.4 The item may only need to survive the transport environment but it will normally be required by function under the operational environment and therefore it may be necessary to carry out shock tests under both conditions, with measurements of parameters after the 'transport environment' test and functional checks during the 'operational environment' test.

5.5 When determining the test severity to be applied, consideration should be given to allowing an adequate safety margin between the operational/transport environment and the test severity.

5.6 Where the shock response spectrum of the operational transport environment is known, reference should be made to Fig. 8 to 12 given in Appendix A of Section 1 of IS : 9000 (Part 7)-1979* to select the shape of the pulse most nearly conforming to that environment.

5.7 For packaged items, the shocks encountered during handling and transportation are often of a simple nature which makes it possible to use a half-sine pulse derived from the observed velocity change.

5.8 When the real operational/transport environment is not known, details should be requested from the user or, if details are not available the appropriate severity should be selected by the specification writer from Table 1 which lists the test severities intended for various classes of transportation and operational use. Reference should also be made to **A-3** of Section 1 of IS : 9000 (Part 7)-1979*.

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*Basic environmental testing procedures for electronic and electrical items : Part 7 Impact test.

TABLE 1 EXAMPLES OF SHOCK TEST SEVERITIES TYPICALLY EMPLOYED FOR VARIOUS APPLICATIONS

(*Clause* 5.8)

SEVERITY			APPLICATION	
Peak Acceleration m/s²	Duration ms	Pulse Shape	Components	Equipment
(1)	(2)	(3)	(4)	(5)
150	11	Final-peak saw-tooth, half-sine or trapezoidal		Basic test for robustness handling and transport. Land based equipment permanently installed and only transported by road, rail or air in secured shock-resistant packages
300	18	Final-peak saw-tooth, half-sine or trapezoidal		Structural integrity of equipment mountings. Equipment installed or transported in secured position of normal road or rail vehicles or in transport aircraft
500	11	Final-peak saw-tooth half-sine or trapezoidal	Components in secured packages and transported by, or mounted in equipment installed in wheeled vehicles for normal road or rail or sub-sonic or super-sonic aircraft, merchant ships and light marine craft. Components for installation in heavy industrial equipment	Equipment installed or transported in a secured position in full cross-country vehicles. Equipment carried loose in normal road or rail vehicles for long periods. Equipment used in industrial areas and subjected to shock from mechanical handling equipment
1 000	6	Final-peak saw-tooth half-sine or trapezoidal	Components in secured packages and transported by, or mounted in equipment installed in full cross-country vehicles, or mounted in portable	Severe handling shocks on road or rail transport. High intensity shocks due to ignition; stage separation of rockets, (space vehicles), aerodynamic buffeting and re-entry

(*Continued*)

TABLE 1 EXAMPLES OF SHOCK TEST SEVERITIES TYPICALLY EMPLOYED FOR VARIOUS APPLICATIONS — *Contd*

SEVERITY			APPLICATION	
Peak Acceleration m/s²	Duration ms	Pulse Shape	Components	Equipment
(1)	(2)	(3)	(4)	(5)
			equipment carried loose in any road or rail vehicles for long periods. Components in equipment installed in sub-sonic or supersonic aircraft	of space vehicles, etc. Portable equipment
5 000	1	Half-sine final-peak saw-tooth	Structural integrity test on semi-conductors, integrated circuits, microcircuits and micro-assemblies	Blast excited shocks on equipment, land, sea or air
15 000	0·5	Half-sine	Structural integrity tests on semi-conductors, integrated circuits and microcircuits	Equipment attached to guns

NOTE — This table is not mandatory, but lists severities which are typical of the various applications. It should be borne in mind that there will be instances where the actual severities experienced in operation differ from those shown in the table.

6. MOUNTING OF TEST ITEMS

6.1 The mounting of test items is specified in IS : 9001 (Part 12)-1977* [*see also* 7 of Section 1 of IS : 9000 (Part 7)-1979†].

7. TOLERANCES

7.1 This test method is capable of a high degree of reproducibility when the tolerance requirements relating to basic pulse shape, velocity change and transverse motion are met. The tolerances should be maintained in all cases when a high degree of reproducibility is required, particularly for tests included in qualification or acceptance procedures.

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*Guidance for environmental testing: Part 12 Mounting of electronic and electrical items for dynamic tests.

†Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

7.2 Exceptions to these tolerance requirements are given in the test [*see* **5.1** of IS : 9000 (Part 7)-1979*] and such exceptions are applicable to items of large mass and/or dimensions, which provide a highly reactive load, such that the tolerance requirements cannot be met. In these cases the relevant specification shall specify relaxed tolerances to be agreed with the customer. Alternatively, the specification may request that the actual performances achieved during the test be recorded in the test report.

7.3 When testing certain types of equipment with mass and dynamic responses which would influence the characteristics of the shock machine, it may be necessary to carry out preliminary shock conditioning to check these characteristics. With complex equipment where only one or a limited number of items are provided for test, the repeated application of shock prior to the definitive test could result in an overtest and possible unrepresentative cumulative damage. In such instances, it is recommended that whenever possible the preliminary checking should be carried out using a representative equipment (such as a rejected equipment), or when such an equipment is not available, it may be necessary to use a weighted space model having the correct mass and centre of gravity disposition. However, it should be noted that a space model is unlikely to have the same dynamic response as the actual equipment.

7.4 Velocity change may be determined in any one of the following ways:

a) from the impact velocity for shock pulses not involving rebound motion;

b) from the drop and rebound height where free-fall facilities are used; and

c) by integrating the acceleration/time curve.

7.5 When specifying the integrating techniques, the actual velocity change should, unless otherwise stated, be determined by integrating between the limits of 0·4 *D* before the start of the pulse to 0·1 *D* beyond the pulse, where *D* is the duration of the nominal pulse. It should be noted that determination of velocity change using the integrating method can be difficult, particularly with the tolerances required by **5.1.2** of the test of Section 1 of IS : 9000 (Part 7)-1979* and the method may require the use of elaborate facilities. The cost implication should be considered before invoking this method.

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

Section 2 Bump Test

1. SCOPE

1.1 This standard (Part 17/Sec 2) deals with guidance for the bump test for electronic and electrical items.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions and explanation of terms given in IS : 9000 (Part 1)-1977* shall apply.

3. OBJECT

3.1 Bump test reproduces the effects on an item, during movement by overland transport, of repeated bumping and jolting which is generally severe and can be of a complex and random nature and which can occur over various periods of time dependent on the length of journey, the track conditions, the type of vehicle or trailer, etc. Repetitive bumping during transport by rail is mainly due to rail discontinuities and is of moderate intensity. Shock pulses of a non-repetitive nature are more appropriately simulated by the shock test (*see* **4**).

3.2 The bump test is performed with the item rigidly attached to the table by subjecting it to a controlled shock pulse injected at the points of attachment. For an item transported as loose cargo, where it can rebound, impact and scuff on the floor of the transporting vehicle, injection of shock is not necessarily at the points of attachment and may be at any of the edges, corners or faces of the item. The bump test may not, therefore, simulate the loading conditions at points of contact between the item and vehicle.

3.3 For items transported as loose cargo in a vehicle, for example, packaged items, bounce test more closely simulates the transport environment and may be more appropriate.

---

*Basic environmental testing procedures for electronic and electrical items: Part 1 General.

4. RELATED TESTS

4.1 The related tests are given below:

Shock test [Section 1 of IS : 9000 (Part 7)-1979*]	— simulates the effects of non-repetitive shock likely to be encountered by equipment and components during transportation or operation.
Drop and topple test [Section 3 of IS : 9000 (Part 7)-1979*]	— is a simple test intended to assess the effects of knocks or jolts likely to be received primarily by equipment-type items during repair work or rough handling on a table or bench.
Free fall test [Section 4 of IS : 9000 (Part 7)-1979*]	— is a simple test intended to assess the effects of falls likely to be experienced due to rough handling. It is also suitable to demonstrate a degree of robustness.
Repeated free fall test [Section 5 of IS : 9000 (Part 7)-1979*]	— also simulates repetitive shocks likely to be received by certain component-type items, for example, connectors in service.
Bounce test (under consideration)	— is intended to simulate the random shock conditions experienced by items which may be carried as loose cargo in wheeled vehicles travelling over irregular surfaces.

4.2 Shock and bump tests are performed on the test item when fixed to the test machine. Drop and topple, free fall, repeated free fall and bounce tests are performed with the test item free.

5. SELECTION OF TEST SEVERITIES

5.1 The specification writer intending to prescribe this test should refer to **1.1** of Section 2 IS : 9000 (Part 7)-1979* to ensure that all such information is included in the relevant specification.

5.2 Wherever possible, the test severity applied to the item should be related to the real environment to which the item will be subjected during either transportation or operation.

5.3 It should be noted that frequently the transport environment is more severe than the operational environment, and in these circumstances the test severity chosen may need to be related to the transport environment.

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

5.4 The item may only need to survive the transport enviroment but it will normally be required to function under the operational environment and therefore it may be necessary to carry out bump tests under both conditions with measurements of parameters after the 'transport environment' test and functional checks during the 'operational environment' test.

5.5 When determining the test severity to be applied, consideration should be given to allowing an adequate safety margin between the operational/transport environment and the test severity.

When the actual operation/transport environment is not known, details should be requested from the customer. If not available, the appropriate severity should be selected by the specification writer from Table 1 which lists test severities intended for various classes of transport and operational use.

5.6 It is emphasized that the bump test is an empiric test and is not intended to simulate precisely the real environment.

6. TEST AXES AND DIRECTION OF BUMP

6.1 The axes and direction of bump impact chosen for the test should be representative of those in which the items will receive bump impacts in transportation or operational use.

6.2 Items which will always be operational or transported on their normal base need be subjected to bumps only when mounted on that base. An item, which during transportation, may be placed on more than one of its faces should be tested in each of the axes and directions defined in the relevant specification.

6.3 The component specification writer should refer to **9.1** and the equipment specification writer to **9.2** of Section 2 of IS : 9000 (Part 7)-1979* for detailed information on the selection of test axes and direction of bump impact and ensure that all the required information is given in the relevant specification.

7. MOUNTING

7.1 The mounting of items is specified in IS : 9001 (Part 12)-1977† [*see also* **6** of Section 2 of IS : 9000 (Part 7) 1979*].

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

†Guidance for environmental testing: Part 12 Mounting of electronic and electrical items for dynamic tests.

TABLE 1 EXAMPLES OF BUMP TEST SEVERITIES TYPICALLY EMPLOYED FOR VARIOUS APPLICATIONS

(*Clause* 5.5)

SEVERITY			APPLICATION	
Peak Acceleration m/s^2	Duration ms	No. of Bumps in Each Specified Direction	Components	Equipment
(1)	(2)	(3)	(4)	(5)
100	16	1 000	Transportation in manufacturers' packing of fragile components by road (excluding cross country)	General robustness test and for equipment installed or transported packed in a secured position in wheeled vehicles with no cross country equipment.
250	6	1 000		Equipment installed or transported in a secured position in full cross-country vehicles. Equipment installed in mechanical handling plant, for example dock cranes, fork-lift trucks
400	6	1 000	Delivery transport in manufacturers' packing of components intended for use in equipment of a non-portable nature	Equipment which may be carried loose in wheeled vehicles (road or rail) for occasional journeys, for example delivery
400	6	4 000	Component for use in transportable equipment	Transportable equipment repeatedly carried loose in any type of vehicle (rail, road or cross country)

NOTE 1 — This table is not mandatory, but lists severities which are typically of the various applications. It should be borne in mind that there will be instances where the actual severities experienced in operation differ from those shown in the table.

NOTE 2 — It is recommended that the test severities of 250 and 400 m/s^2 should be specified only for items less than 100 kg mass. For heavier items up to 500 kg mass the 100 m/s^2 severity is generally more approriate.

NOTE 3 — When testing items of large mass or those which present a highly reactive load to the bump machine it may be necessary for the relevant specification to allow a relaxation on tolerances [*see* **5.1** of Section 2 of IS : 9000 (Part 7)-1979*]

Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

Section 3 Drop and Topple Test

1. SCOPE

1.1 This standard (Part 17 Sec 3) covers guidance details for drop and topple test primarily intended for equipment type items.

2. OBJECT

2.1 The purpose of the drop and topple test is to simulate primarily in equipment-type items, the effects of knocks and jolts which may be received during rough handling of the equipment on a work bench or table or in operational use.

2.2 The test should only be specified for equipment likely to receive such rough handling, for example, those which are small to medium size and mass, and should be applied only to those faces and corners where there is a risk of such treatment being encountered.

2.3 In general, equipment which is frequently handled and serviced (for example, field equipment and unit spares) can be considered to be at risk, whereas equipment forming an integral part of a permanent installation would not normally be considered to be at risk and need not be tested. This test may not be applicable to fragile unprotected equipment or to equipment of irregular shape (for example, aircraft nose radar), which when removed from the installation would be contained in a handling frame or jig. It may, however, be applicable to these items of equipment when they are in their transit case, or in their handling frame or jig. For equipment which would stand only on one face (for example, the normal base) the test is generally applied to that face only.

2.4 The topple test need not be applied to items which have dimensions which make them stable whilst being handled. Reference should be made to **11.0** of Section 3 of IS : 9000 (Part 7)-1979* for information on the 'c-g ratio' and 'height ratio' to establish if the test is necessary.

2.5 The falling or topple actions produced by the test procedures given in **9.2**, **9.3** and **9.4** of Section 3 of IS : 9000 (Part 7)-1979* are illustrated by Fig. 1 to 3.

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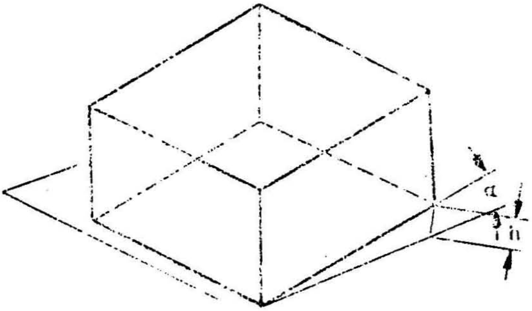
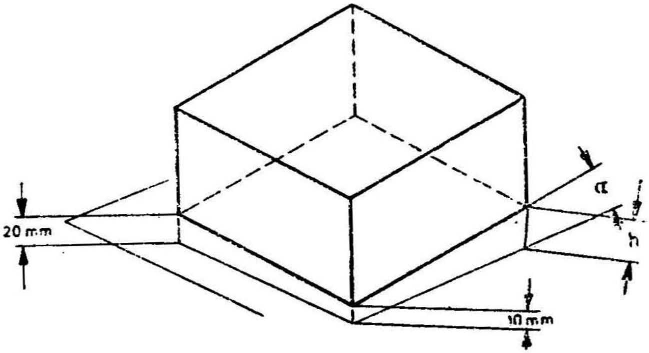
*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.



h — Distance between edge of item and test surface
α — Angle between bottom face of item and test surface

FIG. 1 DROPPING ON TO A FACE



h — distance between edge of item and test surface
α — Angle between bottom face of item and test surface

FIG. 2 DROPPING ON TO A CORNER

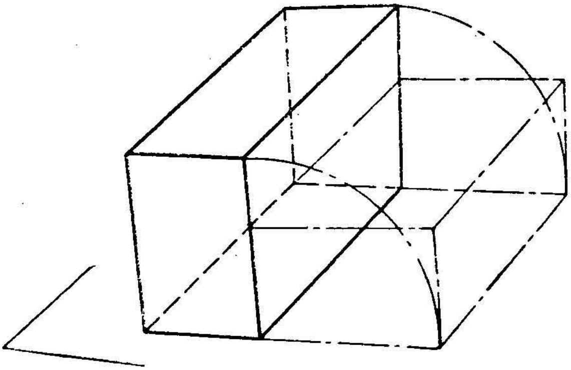


FIG. 3 TOPPLE (OR PUSH OVER)

3. RELATED TESTS

3.1 The related tests are given below:

Shock test [Section 1 of IS : 9000 (Part 7)-1979*]	— simulates the effects of non-repetitive shocks likely to be encountered by equipment and components during transportation or operation.
Bump test [Section 2 of IS : 9000 (Part 7)-1979*]	— simulates the effects of repetitive shocks likely to be experienced by equipment and components during transportation or when installed in various classes of vehicles.
Free fall test [Section 4 of IS : 9000 (Part 7)-1979*]	— is a simple test intended to assess the effects of falls likely to be experienced due to rough handling. It is also suitable to demonstrate a degree of robustness.
Free fall, repeated test [Section 5 of IS : 9000 (Part 7)-1979*]	— also simulates repetitive shocks likely to be received by certain component type items, for example, connectors in service.

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

Bounce test (under consideration)	— is intended to simulate the random shock conditions experienced by items which may be carried as loose cargo in wheeled vehicles travelling over irregular surfaces.

3.1.1 Shock and bump tests are performed on the items when fixed to the test machine. Drop and topple, free fall, repeated free fall and bounce tests are performed with the item free.

4. SELECTION OF TEST SEVERITIES

4.1 The specification writer intending to prescribe this test should refer to **11.1** of Section 3 of IS : 9000 (Part 7)-1979* to ensure that all the information requested is given in the relevant specification [*See* **9.2**, **9.3** and **11.1** (c), (f) and (g) of Section 3 of IS : 9000 (Part 7)-1979*].

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

Indian Standard

GUIDANCE FOR ENVIRONMENTAL TESTING

PART 17 IMPACT TEST

Section 4 Free Fall Test

1. SCOPE

1.1 This standard (Part 17/Sec 4) covers guidance for free fall test.

2. OBJECT

2.1 The free fall test is applicable to items which during transportation, handling or repair work are liable to be dropped from the means of transport or from a work surface. The test is not applicable to very heavy items or those of large dimensions, for example, large power transformers.

3. RELATED TESTS

3.1 The following are the related tests:

Shock test [Section 1 of IS : 9000 (Part 7)-1979*]	— simulates the effects of non-repetitive shocks likely to be encountered by equipment and components during transportation or operation.
Bump test [Section 2 of IS : 9000 (Part 7)-1979*]	— simulates the effects of repetitive shocks likely to be experienced by equipment and components during transportation or when installed in various classes of vehicle.
Drop and topple test [Section 3 of IS : 9000 (Part 7)-1979*]	— is a simple test intended to assess the effects of knocks or jolts likely to be received primarily by equipment type items during repair work or rough handling on a table or bench.
Free fall repeated test [Section 5 of IS : 9000 (Par 7)-1979*]	— also simulates repetitive shocks likely to be received by certain component type items, for example, connectors in service.

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*Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test.

Bounce test (under consideration)	— is intended to simulate the random shock conditions experienced by items which may be carried as loose cargo in wheeled vehicles travelling over irregular surfaces.

3.1.1 Shock and bump tests are performed on the item when fixed to the test machine. Drop and topple, free fall, repeated free fall and bounce tests are performed with the item free.

4. SELECTION OF TEST SEVERITIES

4.1 The specification writer intending to prescribe this test should refer to **10.1** of Section 4 of IS : 9000 (Part 7)-1979* to ensure that all such information is included in the relevant specification [*see* **5.1**, **6** and **10.1** (a), (c) and (d) of Section 4 of IS : 9000 (Part 7)-1979*].

4.2 Where possible, the test severity applied to the item should be related to the expected handling and transport conditions to which the item will be subjected. However, it is neither realistic nor economical to expect all items to survive the most severe mishandling which may be encountered in service, for example, dropping from an aircraft loading platform or from a crane. For tests on items where it is required to demonstrate serviceability, the height of fall should be selected taking into account the risk of occurrence, the tolerable level of damage and conditions of operational use, transportation and storage.

4.3 The appropriate severity, selected from **6** of Section 4 of IS : 9000 (Part 7)-1979* should be related to the mass of the item, the type of handling and transport, and whether the test is to be applied to unpacked items such as sub-assemblies, components, non-portable equipments, or transportable items which are housed in integral transport. cases

4.4 In the absence of precise information on these aspects, a suitable severity should be selected by the specification writer from Table 1 which lists examples of severities appropriate to various transport or handling conditions.

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TABLE 1 EXAMPLES OF TEST SEVERITIES TYPICALLY EMPLOYED

(*Clause* 4.4)

HEIGHT OF FALL	MASS OF ITEM		EXAMPLE OF UNPACKED ITEMS	TYPE OF HANDLING
	Unpacked	In Integral Transport Cases		
mm	kg	kg		
(1)	(2)	(3)	(4)	(5)
25	> 100 ⩽ 250	> 500	Cubicles	*Fork lift trucks
50	> 50 ⩽ 100	⩽ 500	Cabinets	*Fork lift trucks
100	> 10 ⩽ 50	⩽ 200	Switchboards	*Cranes
250	> 5 ⩽ 10	⩽ 100	Portable cases	Storage, stacking
500	> 2 ⩽ 5	⩽ 50	Small items	Fall from conveyor belts
000	⩽ 2	⩽ 20	Components small assemblies	Fall from work benches or tail board of truck

NOTE — This table is not mandatory, but lists severities which are typical. It should be borne in mind that there will be instances where the actual severities experienced in handling differ from those shown in the table.

*This is intended to simulate the impact when lowered to the loading level by a fork lift truck or crane, not dropping from the platform of the truck or sling of the crane.

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